Remarks

Reconsideration of the application is respectfully requested.

Upon entry of the foregoing amendments, claims 1-12 are pending in the application, with claims 1 and 7 being the independent claims.

Based on the above Amendment and the following Remarks, Applicant respectfully requests that the Examiner reconsider all outstanding objections and rejections and that they be withdrawn.

Objections to the Drawings

The Office Action on page 2 in section 1 objects to the drawings under 37 C.F.R. § 1.83(a) for failing to show every feature of the invention specified in the claims. Specifically, with respect to claim 1, the Office Action asserts that the drawings do not show "a plurality of adaptive filters" and "an evaluator". To overcome this objection, claim 1 has been amended to recite "a plurality of processors" and remove the evaluator. Claims 3-7 and 9-12 have also been amended accordingly.

With respect to claim 3, the Office Action asserts that the drawings do not show a comparator for comparing the power with the "predefined threshold". Although claim 3 does not expressly recite "a comparator", the Office Action appears to be asserting that claim 3 requires a device for determining when the power "is above a predefined threshold". It is respectfully submitted that the recited controller performs the functions recited in claim 3 as shown in Figs. 1, 4, and 5, for example. As described in the specification on page 5, lines 5-28, and as shown in Figs. 1, 4, and 5, for example, the controller 111 can, for example,

calculate the power of the tap coefficients h(t) for the segments, and according to the tap coefficients h(t), supply the local input signal and the calculated signal for the segments to the 16 bit processor 112 and the 8 bit processor 114 through the scale converter 113. When the power for the tap coefficients h(t) for the segments is above a predetermined threshold at the time for adjusting the tap coefficients, the product for the segments is computed using the 16 bit processor 112. When the power of the tap coefficients h(t) for the segments is below the predetermined threshold at the time for adjusting the tap coefficients, the product for the segments is computed using the 8 bit processor 114. Hence, the controller 111 calculates the power and supplies the local input signal to the appropriate processor based on a threshold.

In view of the above, Applicant respectfully requests that these objections be withdrawn.

The Office Action on page 2 in section 2 objects to the drawings as being informal. Applicant submits concurrently herewith formal drawings for Figures 1-5. Accordingly, Applicant respectfully requests that this objection be withdrawn.

Rejections under 35 U.S.C. § 112

The Office Action on page 3 in sections 4-5 rejects claim 1 under 35 U.S.C. § 112, first paragraph, because claim 1 contains subject matter that is not described in the specification. Specifically, the Office Action asserts that "an evaluator coupled to said adaptive filters for grouping coefficients into a plurality of segments" is not adequately described in the specification. In view of the above amendments and based on the following remarks, Applicant respectfully traverses this rejection.

The specification on page 5, line 5 states that the controller 111 groups the tap coefficients into the segments corresponding to the transfer characteristics. Claim 1 has been amended to remove the recitation of "an evaluator" and instead recite the "controller" as performing the recited function. Accordingly, Applicant respectfully requests that this rejection be withdrawn.

Rejections Under 35 U.S.C. § 102

Embodiments of the present invention relate to a method and apparatus for reducing the computation of an echo canceler by using a different computational accuracy processing (e.g., 8-bit processing or 16-bit processing) for each segment. (See, specification, page 5, lines 5-28). Claim 1 recites "plurality of processors which have different computational accuracy" and a controller "for grouping coefficients into a plurality of segments, evaluating a computational accuracy information according to the coefficients for said segments, assigning [a] local input signal into said processors, and adjusting the coefficients according to the computational accuracy information."

As described in the specification, and as shown in Figs. 1, 4, and 5, for example, the controller 111 can, for example, calculate the power of the tap coefficients h(t) for the segments, and according to the tap coefficients h(t), supply the local input signal and the calculated signal for the segments to the 16 bit processor 112 and the 8 bit processor 114 through the scale converter 113. When the power for the tap coefficients h(t) for the segments is above a predetermined threshold at the

time for adjusting the tap coefficients, the product for the segments is computed using the 16 bit processor 112. When the power of the tap coefficients h(t) for the segments is below the predetermined threshold at the time for adjusting the tap coefficients, the product for the segments is computed using the 8 bit processor 114. Hence, the controller 111 calculates the power and supplies the local input signal to the appropriate processor based on a threshold.

Rejection of claims 1-4 and 7-10 as being anticipated by Kusano

On pages 3-4 in sections 6-7, claims 1-4 and 7-10 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,477,534 to Kusano. Based on the above amendments and the following remarks, Applicant respectfully traverses this rejection.

As discussed above, claim 1 recites a "plurality of processors which have different computational accuracy." Kusano, however, does not teach or suggest such using a different computational accuracy processing for each segment. Instead, Kusano teaches that a variable coefficient series is divided into blocks and that a coefficient updating frequency, a loop gain, and an initial pattern are changed for each block. However, there is no disclosure in Kusano of reducing the computation of an echo canceler by using a different computation accuracy for the divided segments.

As recited in independent claims 1 and 7, the processors have different computational accuracy. The controller assigns the local input signal to the processors. The processors generate the echo replica. As the processors have

different computational accuracy, the local input signal is processed with a different computational accuracy.

In view of the above, it is clear that the cited reference does not disclose every limitation recited in the claims, such as the processors having different computational accuracy, as is required by 35 U.S.C. 102. Therefore, the withdrawal of this rejection is respectfully requested.

Rejection of claims 1 and 7 as being anticipated by Hasegawa or Ishii

On pages 5-6 in section 8, claims 1 and 7 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,035,312 to Hasegawa, or U.S. Patent No. 5,960,077 to Ishii et al.

As discussed above, independent claims 1 and 7 recite that the processors have different computational accuracy. The controller assigns the local input signal to the processors. The processors generate the echo replica. As the processors have different computational accuracy, the local input signal is processed with a different computational accuracy.

Hasegawa teaches that a variable coefficient series is divided into blocks. The proprietary of coefficient updating is decided by a validity of coefficient updating every block.

Ishii et al. teaches that a variable coefficient series is divided into blocks and that the blocks are regarded as an independent echo canceler.

Rejection of claim 1 as being anticipated by Sugiyama

On page 6 in sections 9-10, claim 1 is rejected under 35 U.S.C. § 102(e) as

being anticipated by U.S. Patent No. 6,442,274 to Sugiyama. The Office Action asserts generally that Sugiyama teaches the echo canceller shown in Figure 1 of the present invention. Sugiyama describes a multi-channel echo canceler. Sugiyama is directed to an echo canceler suitable for multiplexed lines. Not surprisingly, the disclosure of Sugiyama is quite different from the present invention.

As recited in independent claims 1 and 7, the processors have different computational accuracy. The controller assigns the local input signal to the processors. The processors generate the echo replica. As the processors have different computational accuracy, the local input signal is processed with a different computational accuracy.

Sugiyama does not disclose, teach or suggest using different computation accuracy processing as recited in the rejected claims. In view of the above, Applicant respectfully requests that this rejection be withdrawn.

Rejections Under 35 U.S.C. § 103

On pages 6-8 in sections 11-12, claims 5 and 11 are rejected under 35 U.S.C. §103(a) as being unpatentable over Kusano in further view of U.S. Patent No. 5,892,757 to Norrell et al.

Claims 5 and 11 depend from independent claims 1 and 7, respectfully, and are patentable for at least the reasons described above regarding independent claims 1 and 7. Norrell et al does not supplement Kusano to teach or suggest the present invention. Norrell et al. is directed to an echo canceler for a two-way modem. Norrell et al. teaches a general supervisory

microprocessor. However, Norrell does not supplement Kusano to teach or suggest using different computation accuracy processing.

On page 8 in section 13, claims 6 and 12 are rejected under 35 U.S.C. §103(a) as being unpatentable over Hasegawa in further view of Norrell.

Claims 6 and 12 depend from independent claims 1 and 7 respectfully and are patentable for at least the reason discussed above regarding independent claims 1 and 7. Norrell et al., discussed above, does not supplement Hasegawa to teach or suggest the present invention. Neither makes any mention of using different computation accuracy processing as is recited in the rejected claims.

In view of the above, Applicant respectfully requests that these rejections be withdrawn.

Conclusion

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicant believes that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is hereby invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment is respectfully requested.

Respectfully submitted,

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